

The Supply Chain for the Ocean Energy Industry in Ireland

Discussion Paper

June 2013



Executive Summary

Ireland has an unprecedented opportunity to build a position of strength as a supply chain to the world- wide ocean energy industry. The policy landscape – including required legislation and provision of a policy framework for ocean energy- is moving in a positive direction but a greater sense of urgency is required. Most importantly, Government is negotiating an export framework with the United Kingdom which could provide a market for all forms of Irish marine energy and exploit our formidable offshore energy natural resource with potentially significant new job creation.

The development of an export market with the UK would provide a market for Irish ocean energy, but enabling actions are still required. Firms in the supply chain are aware of the ocean energy opportunity but need the confidence which would be provided by more overt Government leadership of the sector and, most important, the development of real business opportunities.

In particular, the Irish Government needs to give the private sector the confidence to invest in ocean energy and enable business interests to build a base to serve world-wide markets for ocean energy equipment and services. This can be achieved through the provision of a:

- An allocation of ocean energy Renewable Energy Feed-In Tariff (REFIT) to incentivise early investment
- Clear consenting process administered by a single body (An Bord Pleanála) offering developers – whether of demonstration arrays or, later, of export oriented ocean energy farms - a clear route to a fully consented site...with a proactive landlord in the form of the Department of Environment, Heritage and Local Government
- Capital grants regime which addresses the needs of device developers for substantial support at this critical emergent stage of ocean energy technology
- Clear route to grid access for demonstration arrays and, in time, ocean energy-based electricity exporters.
- A strong Ocean Renewable Energy Development Plan backed up by an implementation group with industry involvement

The absence of any of the elements would be a severe impediment to the growth of ocean energy in Ireland.

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1. Marine Renewables Industry Association

The Marine Renewables Industry Association (MRIA) represents all of the main interests on the island of Ireland engaged in the wave and tidal sector of marine renewables energy, also known as ocean energy¹. The Association includes firms engaged in device development and manufacture, utilities and site developers, professional firms and consultants, R & D businesses and academic researchers. The Association is an all-island body. For further details, please go to the Association's web page, www.mria.ie. You may follow MRIA on Twitter at @Marineireland.

2. Ocean Energy and Ireland

2.1 Potential Economic Impact of Ocean Energy

The Republic of Ireland is in the midst of an economic depression while Northern Ireland is also going through a period of economic difficulty with consequent loss of employment and income. Ocean energy has the potential to make a significant employment and wealth creation impact over time. A study commissioned by the relevant State agencies on the island, Sustainable Energy Authority of Ireland and Invest Northern Ireland, on the potential economic impact of ocean energy² states that:

There is currently sound quantitative evidence that by 2030 a fully developed island of Ireland OE sector providing a home market and feeding a global market for Renewable Energy could produce a total Net Present Value (NPV) of around €9billion and many thousands of jobsIt is possible that an island of Ireland wave energy industry meeting the 500MW 2020 target could produce at least 1,431 additional FTE jobs and an NPV of €0.25bn, increasing to 17,000-52,000 jobs and an NPV of around €4-10bn by 2030.....Similarly a tidal industry providing 200MW of capacity by 2020 may deliver around 600 FTE jobs and an NPV of €111m, increasing to 8,500-17,000 jobs and an NPV of between 41.5-2.75bn by 2030 -SQW Executive Summary

The technology challenges faced by ocean energy, particularly in the wave field, coupled with the slow pace of policy development and implementation, make the achievement of the 'SQW' projections to 2020 unlikely. Nonetheless, the possibilities they represent remain valid, albeit over a longer time-scale because e.g. in the view of the EU Ocean Energy Association:

'As a fledgling industry, the European ocean energy sector is making positive progress. Several European utilities and engineering giants from Europe, the US, Japan and Korea

¹ Wave + tidal energy = ocean energy (+ offshore wind) = marine renewables or marine energy

² Economic Study for Ocean Energy Development in Ireland SQW, 2010

have all invested in SMEs, testing programmes and early project development in Europe. This clearly points to growing confidence in the viability of these technologies³.

The opportunity in Irish ocean energy has two possible dimensions- ENTERPRISE and ELECTRICITY EXPORT-for the purposes of this Paper, although there may be some scope for local electricity supply in the medium/long term. Both of these points are dealt with briefly below (see also: MRIA's *Response to Public Consultation on draft Ocean Energy Development Plan* at www.mria.ie)

2.2 Enterprise

The ENTERPRISE element ranges from research and development and device manufacture to operations and maintenance, finance and legal support. This 'supply chain' faces an immediate opportunity in offshore wind in the UK which is developing rapidly into a major industry and there will be opportunities in onshore wind, at least in the home market, when the 'export deal' comes to fruition- see 2.3 and 4.2 below. These prospects will give both early job and early income benefits to Ireland and will also build companies and grow their experience and their skills to capitalise on the later wave and tidal opportunity. Ireland could become a major base for the supply of ocean energy equipment and services world-wide..... provided that the industry gets appropriate Government support.

However, this journey must begin with the deployment of single devices and small wave 'farms' where initial capital costs are high. If Ireland wishes to capture the enterprise element to ocean energy, then the policy elements must be put in place now, notably support for capital expenditure and for operating costs (REFIT). Ireland missed out on the world-wide supply chain opportunity for wind – largely captured by US, Scandinavian etc companies – in spite of our outstanding resource both on land and at sea. The reasons for this failure are complex and relate to the overall state of (lack of) development of the economy at the time that the technology was in its infancy and other factors. The effect is that Ireland's supply chain effort in wind is confined to downstream activities such as operations and maintenance although this may be reversed, to some extent, by the scale of opportunity posed by the 'export deal' (see 4.2).

It would be a historical failure by policy- makers if Ireland fails to capitalise on our ocean energy supply chain opportunity. Ireland has still got an 'early-mover' position (excellent R and D facilities, leading device developers etc) and a magnificent resource (which is significantly more energy proficient than its Scottish counterpart). The missing ingredient is government commitment and conviction.

2.3 Exporting Electricity

All of the stakeholders in ocean energy accept that the enormous scale of the Irish resource in wave (together with a much lesser resource in tidal) represents a

³ *Industry Vision Paper 2013* European Ocean Energy Association 2013

potentially huge opportunity for ELECTRICITY EXPORT via grid interconnectors. This is based on the likely emergence of an EU energy market and a Euro grid; potential export demand in the UK; the development of ocean energy technology and other factors. Moreover, large scale deployment of ocean energy devices will drive the cost of ocean energy down as 'economies of scale' and the 'learning curve' effect kick in.

A key advantage for Ireland – apart from our bountiful wave resource – is the quality and extent of our R and D facilities and activities: the new Beaufort Laboratory in Cork; SmartBay, led out of Galway; the Atlantic Marine Energy Test Site in Co Mayo; and the expertise and facilities at Queens University, Belfast together with the work underway in other colleges and the recent €25m in support from Science Foundation Ireland for the MaREI ocean energy research project involving 9 colleges and institutions and 47 industry partners. These formidable assets give Ireland the capacity to build a significant position at the frontier of ocean energy intellectual capital formation.

2.4 Local Market

The EU's policy is to decarbonise energy to a substantial extent by 2050. This can be achieved either through stringent national renewable energy targets and/or by market forces through carbon pricing which would have the effect of encouraging significant increases in renewable energy. The mix of renewable technologies (e.g. wave v wind v solar v tidal etc) will depend on their relative economics which in large measure will be dictated by capital costs, operations and maintenance needs, transmission costs etc. In time, as we decarbonise energy in line with EU policy and ocean energy technology matures, there is likely to be a local market for ocean energy to ensure we have a balanced renewables portfolio available to the grid and assuming also, of course, that ocean energy can become competitive with offshore wind.

In the near-term, however, we must be prepared to host on the grid, and to support financially, early stage ocean energy projects to put Ireland and Irish companies on the map in this sector and gain 'early-mover advantage' and credibility. The total generating capacity (MW) involved is unlikely to exceed two figures over the next number of years.

3. Background and Terms of Reference

3.1 Background

This paper is the third in a series of studies into long-term development issues in ocean energy undertaken by the MRIA. The first of these dealt with the third-level education needs⁴ of ocean energy and has directly led to the generation of a Masters degree in engineering focused on ocean energy which will be executed jointly by a number of

⁴ *Third-Level Education Needs of the Ocean Energy Industry – to maximise the job and income potential of Ireland's ocean energy resource* MRIA August 2011

institutions (led by University College Cork) . The new degree will be launched in time for academic year 2013/14. The inter-college task force established to develop this project was led by the Association. The second study reviewed research and development in ocean energy in Ireland⁵ and was published in September 2012- it arrived at a series of five research priorities in ocean energy both for the research community and, also, for those engaged in the allocation of research resources.

There have been a number of studies⁶ undertaken into the supply chain for ocean energy in Ireland, notably by the Sustainable Energy Authority of Ireland (SEAI). These have been complemented by similar work elsewhere, notably in the United Kingdom. These studies – many of which deal also with the complementary area of offshore wind - have been invaluable in establishing the facts about the supply chain and identifying the gaps in provision and capability and what ought to be done about them.

The most recent study⁷ (by SLR Consulting) rated all elements of the existing Irish supply chain in terms of ‘Red’ (low or no local capability- the most important example is the lack of local capacity in subsea cable manufacture and installation); ‘Amber’ (some capability – examples include hull manufacture, wave energy device installation); and ‘Green’ (strong capability – for example, electrical/controls, mooring). Among the actions suggested to develop the supply chain were: facilitate and encourage joint ventures and the emergence of clusters, further investment in R and D etc.

Another excellent study was that undertaken for SEAI by ESB Ocean Energy⁸. This examines the supply chain for the WestWave project and was particularly valuable because it relates back to a distinct and important ocean energy project

3.2 Terms of Reference

In 2012, the MRIA decided to look at the issues surrounding the supply chain from a different perspective- the views of the participants (and potential participants) in the industry on the issues which, in their view, face them in ocean energy. Specifically:

*The project will tackle a key issue- supply chain needs, capabilities and opportunities – at a crucial stage for the emerging industry of ocean energy. The project will complement the study in this area commissioned by SEAI and Enterprise Ireland as it will focus on the views of the industry ...It will present a clear view of the industry need, the obstacles in the path to fulfilling that need with maximum return to the local economy and the broader opportunities, notably in export markets and in the related offshore wind industry-*EXTRACT

FROM MRIA APPLICATION TO SEAI

⁵ *Research and Development and Ocean Energy- A Review of Research and Development in Ocean Energy in Ireland* MRIA September 2012

⁶ These are referred to later in this paper.

⁷ *A Study of the Supply Chain Requirements and Irish Company Capability in the Offshore Wind, Wave and Tidal Sector* SEAI and Enterprise Ireland, prepared by SLR Consulting April 2012

⁸ *Supply Chain Study for WestWave* ESB Ocean Energy, November 2011

Views, principally of industry right across the supply chain, were gathered, almost always by face-to-face interviews, during late 2012. The support of the Sustainable Energy Authority of Ireland for this project is gratefully acknowledged.

The paper focuses exclusively on the Republic of Ireland in the light of SEAI support. However, it should be noted that the Association is an all-island one and this is reflected in the make-up of MRIA's membership and its overall approach.

A list of those companies and institutions interviewed for this paper is contained in the Appendix.

4. Policy and Business Landscape

4.1 Policy Developments

Ocean energy is an emerging technology. Wave and tidal devices are now at the pre-commercial stage with a number of technologies being tested at full-scale and plans in place for the first small arrays. Experts suggest that we will start to see the first small commercial farms in Scottish waters in the next few years (drawn from FP7, NER 300, MRCF and MEAD projects- perhaps eight in all) with commercial maturity possible in the early to mid-2020s. In Ireland, the WestWave project and other emerging projects alone should, if appropriately supported, give Ireland a significant position at the starting line of this important new industry... but suitable capital and operational support must be made available by Government.

The capital intensive nature of ocean energy, the enormous investments that will be required by individual commercial developments at sea and the long lead-times associated with the energy industry determines that both industry and Government must make preparations now.

If Ireland succeeds in putting a foreshore licensing and leasing process in place by 2014, a sample timeline (derived from a suggestion by Aquamarine Power, others may argue that in fact the process needs to run over an even shorter timescale if our opportunity to be world leader in the supply chain is to be realised) might be as follows:

- 6-9 months to run a leasing round and secure a lease (2015)
- 2 years pre-application environmental monitoring (2017)
- 1 year EIA preparation and consent determination (2018)
- 1-2 years to close financial arrangements and, also, to allow for slippage(2019-20)
- Install first farms (2019 or 2020 at latest).

The compelling factor, the reason that this industry should be singled out for special attention, is the scale of the opportunity it presents for jobs and income creation in Ireland.

The supply chain, therefore, must be viewed against the backdrop of policies to support its development and, in particular, to support the growth of business opportunities.

There was a steady drumbeat of helpful developments over the past 18 months or so. Ocean energy has been singled out as a national priority for research and development support⁹. Supporting the emergence of the industry was deemed one of a handful of strategic goals set for national energy policy to 2020¹⁰. The latest policy statement on the Green Economy, published in November 2012, also highlighted the potential importance of the sector and pledged support.¹¹ Financial support has been approved for the new Beaufort Laboratory at IMERC which will house tank testing and other facilities and for further developments at the test site for quarter-scale devices in Galway Bay (part of 'SmartBay').

Looking to the immediate future, the Ocean Renewable Energy Development Plan will be published shortly. The consultation on the long-awaited Foreshore Bill has concluded. It is anticipated that the Bill will reach the statute books in 2014 and should provide a modern system to license and lease ('consent') sites for ocean energy. The Foreshore Bill must be viewed in parallel with other vital measures such as the provision of grants and revenue support. All these must be in place before investors will have the confidence to build wave etc farms in Ireland.

Financial support by Government has increased in 2013, albeit from a low base, and, for example, further capital works at the Atlantic Marine Energy Test Site in Co Mayo are anticipated this year.

In spite of recent progress, much remains to be done: the sector needs a substantial uplift in capital grant support to enable early developments; operating support – REFIT – is vital to support demonstration projects etc.

4.2 Facilitating Exports to UK

The Irish and British Governments are engaged in negotiations on a framework to enable trading in electricity between the two countries which, from the Irish perspective, will facilitate exports. In the background are several major (mostly onshore) wind-based projects at the early planning stage. All of the informal indicators point to overall Inter-Government approval by late 2013 or early 2014.

⁹ *Report of the Research Prioritisation Steering Group*, Forfas March 2012

¹⁰ *Strategy for Renewable Energy:2012-2020* Department of Communications, Energy and Natural Resources, 2012

¹¹ *Delivering our Green Potential - Government Policy Statement on Growth and Employment in the Green Economy* Department of Jobs, Innovation and Enterprise November 2012

The implications for ocean energy are significant. Agreement between the two countries would allow a number of large wind projects to go ahead- various numbers have been speculated about but a cumulative twelve GW of new capacity is conceivable over the next ten years. The employment implications are very significant. More important, from an ocean energy point of view, is that exports, and export facilities, will be opened up which undoubtedly will benefit both wave and tidal when they reach commercial maturity and scale.

The scenario sketched above would in practice galvanise the supply chain for wind offshore as such projects are likely to form part of the first round of export projects. The key thing here is that the supply chain for onshore wind has some overlap (e.g. in its engineering requirements) with that for offshore wind and that in turn overlaps to an extent into wave and tidal energy developments.

5. Supply Chain Trends

5.1 International Trends

‘Global supply chains are the connective tissue that allows fractionalised and dispersed stages to operate as a harmonious whole’¹² according to one authoritative definition or, in the more popular parlance of Wikipedia, ‘A supply chain is a system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to the end customer.....’

Prior to the modern computer age- say, before the mid-1980s – supply chains tended to be concentrated around primary industries. Thus, the large population of the UK and other forces (e.g. requirement to be proximate to coalfields to fuel the vital steel mills) led to the creation of a car industry there. The supply chain to that car industry located nearby – typically in the West Midlands – as high transport costs and the need for economies of scale led to a concentration of suppliers locally.

The spread of accessible, affordable and increasingly capable Information and Communications Technologies (ICT) over the past thirty years allowed for the ‘unbundling’ of the supply chain, particularly when coupled with access to low- cost locations and less expensive transport (deregulated aviation, for instance). This development had two common features in different sectors:

- *Fractionalisation* (unbundling of supply chains into finer stages of production); and
- *Geographic dispersion* of the unbundled stages.

¹² This section draws on *Free Exchange Chains of Gold* in the *Economist* August 4th 2012 and related papers

Studies¹³ have noted that one key experience is that there has been limited technology transfer from multinational components of the supply chain to locally owned suppliers, an observation borne out by past Irish experiences.

5.2 Past Irish Experiences with Supply Chains

There are at least two prior Irish experiences with supply chains that are illuminating for the ocean energy industry.

First, the influx of electronics companies here in the 1980s and 1990s presented apparently huge opportunities for the local manufacture of products such as enclosures for personal computers and printed computer manuals. The market reacted in two ways. First, multinational companies, in fields such as components, located facilities in Ireland to service their multinational end-product manufacturer-clients with Irish plants. Second, local companies, typically in electrical and mechanical engineering and print + packaging, sought out and initially, at least, some of them won business. They were aided in this by the Government's National Linkages Programme (see 12. below). Local companies, however, in many cases did not recognise and deal with an underlying strategic reality: multinational primary manufacturers evolved inevitably to the lower cost and less complex approach of securing a (limited in number of suppliers) supply chain which can support them *globally*. Local companies needed to scale up and internationalise quickly and many were unable to meet this challenge.

Second, there is the experience of the aircraft industry. The Republic of Ireland does not manufacture aircraft. But the combination of an internationally well-regarded aviation tradition and the impact of the foundation and growth here of the world's largest aircraft leasing company, GPA (now subsumed into GECAS, part of US giant, GE), coupled with more generic features such as low corporate tax rates etc has led to Ireland becoming an international force in aviation in certain high value-added sectors. Ireland is commonly regarded as the global centre for aircraft finance and has a significant presence also in aircraft overhaul, components, engine repair and, of course, airlines (not only well known names such as Ryanair and Aer Lingus but also important European contract freight carrier, Air Contractors Ltd). The financial end of aircraft leasing industry¹⁴ alone employs almost a thousand people and manages €80bn + in aircraft with an annual tax contribution of €309m (2008) to the Irish Exchequer.

5.3 Implications for Ocean Energy Supply Chain

The implications of international and local trends and experiences for the existing and potential Irish supply chain to the ocean energy industry are several:

First, the large scale supply chain opportunity (see 4.2 above and 6. below) – inferred by the forthcoming export deal and inferred, also, by the development at a later stage of

¹³ See footnote 12

¹⁴ Pre Budget Submission to the Department of Finance Budget 2009 September 2008 Federation of Aerospace Enterprises in Ireland

our wave resource in particular – will be met. *The issue is the extent to which Irish companies will be involved and, indeed, also the extent of value ‘captured’ here by new Foreign Direct Investment (FDI).* Moreover, the relative lack of a mobilised supply chain could impact on our energy prices. PWC points out in a recent study, which has a bearing on ocean energy, concerning the oil and gas industry that ‘.....few Irish specialist suppliers also means higher costs than elsewhere...The time-lag to get a discovery to market, however, allows for specialist industry to ramp up¹⁵’.

We should also recognise that there is a significant opportunity to capture large elements of the supply chain – in areas such as resource assessment, Environmental Impact Assessments (EIA) and civil engineering – in the c5-year run-up to the installation of early devices – provided a clear policy framework and, above all, a positive government action plan is put in place.

Second, Government may have a role to play in ensuring that local companies are prepared and able to compete- see 9 and 12.

Third, the lessons of other Irish experiences suggest that Ireland should aim for a strong presence at the upper end of the supply chain i.e. in high value-added sectors such as R and D (we have world class facilities in place or at advanced planning), finance, elements of engineering etc. The Association’s view is that Ireland should aim appropriate Irish companies at the global market for marine renewables rather than just at short-term local opportunities i.e. focus on the global supply chain. There is an important role for IDA Ireland to fill in the gaps in both our global and our local supply chain offering with new overseas firms, as happened in other sectors in the past. Enterprise Ireland, of course, has a crucial part to play in preparing and supporting indigenous firms for the emerging opportunity

Finally, studies indicate that fragmentation of the supply chain is greatest among neighbours¹⁶. In other words, there may be mutual benefits to Ireland and Scotland colluding on the development of a regional ocean energy cluster.

6. Scale of Opportunity....and Readiness

Ocean energy is maturing and there is confidence that the technical challenges can be overcome and there is a substantial amount of, for example, pilot and demonstration work underway around the world e.g. a 10MW consented tidal array at the Sound of Islay, Scotland and a 40MW wave array west of Lewis, Scotland. One authoritative study¹⁷ has identified twenty four countries which have developed some form of ocean energy conversion system including nineteen which have installed wave systems and

¹⁵ *Making the most of our natural resources in Ireland: oil and gas exploration in Ireland* PWC May 2013

¹⁶ See footnote 12.

¹⁷ *Wave and Tidal Energy Report* Altprofits, updated May 2011

thirteen which have installed tidal stream systems. Another report¹⁸, in 2010, stated that the ocean energy industry had installed and tested c14MW of capacity in fifty different pilot projects. At the time of publication, it identified over one hundred ocean energy projects under development totalling 1GW across fifteen countries. A total of sixty per cent of the activity was wave driven and the balance was tidal.

The scale of the opportunity in ocean energy is potentially vast.

6.1 International

The potential contribution of wave energy to world electricity is estimated at 2000TWhrs pa and this is comparable to 12% of world electricity consumption and comparable also to the amount produced worldwide by large scale hydroelectric projects. Indeed, the International Energy Agency has stated that 'In theory, oceans could meet the world's energy needs in their totality'¹⁹! The global tidal energy potential is estimated at 2.5-3.0 TW with about 1TW being available in comparatively shallow waters- estimates of potential electricity generation lie between 200- 400 TWhrs.

Once the technology matures, the scope for Irish companies to sell ocean energy products and services into export markets is substantial.

6.2 Regional

The principal regional market²⁰ for the Irish ocean energy supply chain is the UK, notably Scotland which is the centre of the UK's ocean energy drive and the leading global location for the industry at present. The development rights awarded by the Crown Estate for Pentland Firth and Orkney waters for ocean energy projects in the 2008-2010 leasing round alone amount to a total potential capacity of 1,600MW. The Crown Estate has estimated that this will involve a total capital investment of more than sterling £6 billion²¹ with significant operations and maintenance and other lifecycle costs on top of this. Offshore wind developments on both the East and West coasts is already underway with the UK forecast to account for half of the forecast installed European capacity of over 30GW by 2020- 1.5GW of UK offshore wind is in place with a further 8 projects planned. There is a real and immediate opportunity in offshore wind in UK waters today.

¹⁸ *Global Ocean Energy Markets and Strategies 2010- 2030* IHS Emerging Energy Research October 2010

¹⁹ *Harnessing the Power of the Ocean*, Gouri S Bhuyan, IEA Open Energy Technology Bulletin Issue No. 52 July 2008

²⁰ Open Hydro Ltd illustrates, however, the global nature of the business and the need to compete at all levels internationally. The Louth-based tidal device developer is engaged in significant projects in Northern Ireland, Scotland, the Channel Islands, France, Canada and the US.

²¹ *Wave and tidal energy in the Pentland Firth and Orkney Waters: how the projects could be built*, p12 by BVG Associates for the Crown Estate May 2011

6.3 Local

The capacity of wave energy to meet Ireland's energy needs is enormous. SEAI estimate²² that accessible wave energy could have met 76% of the Republic's consumption of electricity in 2006 while the potential for tidal is much more limited – the limited resource is concentrated on the east coast with only a small resource in the west (in the Shannon estuary in particular).

The viable contribution to the national grid of both wave and tidal is variable as it depends inter alia on the progress of technology and, of course, the level of support for ocean energy (n.b. the 'REFIT' financial support) and the price of alternative sources of energy. Nevertheless, by any standards, wave has the potential to make a significant contribution to the Republic's electricity needs if required and, more importantly, to export markets. Moreover, there are no obstacles to Irish firms selling devices, components and services internationally. In addition, there are the opportunities in Northern Irish waters (two Republic of Ireland companies- Open Hydro and DP Energy featured on the list of 'winners' in the recent Northern Ireland leasing conducted by the Crown Estate). And, of course, there is the onshore wind market which overlaps to an extent in its requirements with ocean energy- there is already an installed base in the Republic in excess of 2GW which represents almost a third of the national capacity and which is added to in each year. The opening of electricity exports (see 4.2) will expand this opportunity enormously and exports will also prompt the development of offshore wind where consultants Garrad Hassan concluded quite recently that '...even with very conservative allowances for social and environmental constraints, there is an enormous offshore wind resource in the Irish EEZ (Exclusive Economic Zone), even within 50m water depth'²³.

The SQW Report –see 2. - on potential economic benefits of marine renewables to the island of Ireland bears out the scale of the opportunity in ocean energy and offshore wind and its potential for job and income creation.²⁴

6.4 Nature of the Supply Chain

It is generally accepted that the supply chain for ocean energy divides into a number of components which are illustrated in Figure 1 below which also shows one effort to divide up the total lifecycle costs

| Component | % Total Cost |
|------------------|---------------------|
| Structure | 34 |
| Mechanical Plant | 14 |

²² *Wave Energy Resource Atlas Ireland* SEI 2005

²³ *Industrial Development Potential of Offshore Wind in Ireland*, p28, for SEAI by Garrad Hassan February 2011

²⁴ See footnote 2

| | |
|----------------------------------|------|
| Vessels | 12 |
| Moorings and Foundations | 9 |
| Other Installation | 8 |
| Other Manufacturing (misc) | 7 |
| Electrical Plant | 6 |
| Cables, grid connection | 5 |
| Assessment & Demonstration | 4 |
| Logistics Base (ports, harbours) | 1 |
| Total | 100% |

Figure 1

This table is derived from a study commissioned by the Scottish Government’s Marine Energy Group²⁵ (in addition, site development and environmental investigations must be taken into account). A key feature of this study was the estimate, following a survey, of how much of the capital expenditure would be ‘retained’ in Scotland including mechanical plant (11% Scotland); electrical plant (29.3% Scotland); cables, umbilicals and communications, grid connection (31.5% Scotland) and installations vessels (36.7% Scotland) with ‘other UK’ accounting for 30% of the total and ‘rest of EU’ for almost all of the remainder. Even given that Scotland’s heavy industry capacity and experience outweighs that of the Republic, this work suggests that there should be a significant market for locally located companies as the Irish opportunity begins to be realised at scale in both wind and, particularly, ocean energy.

6.5 Readiness to Seize Opportunity

There have been a number of studies on the capacity and capability of the local business base to exploit local ocean energy and offshore wind opportunities. They divide into two categories: *shipping and ports* and, separately, *industry*.

Shipping and ports has been examined on two recent occasions. The first ‘RPS’ report²⁶ indicated that significant investment is required in the national port infrastructure if a major round of offshore energy development were to occur. Equally, the supply of vessels, particularly specialist vessels, was deemed to be limited and would need significant growth to sustain any locally supported marine renewables development of

²⁵ *Marine Energy Supply Chain Survey* by IPA and Sgurr Energy for Scottish Government 2009

²⁶ *Assessment of the Irish Ports and Shipping Requirements for the Marine Renewable Energy Industry* SEAI in co-operation with IMDO Ireland, prepared by RPS June 2011

scale. The most recent study²⁷ identified three ports that were capable of supporting marine renewables and others that would be able to do so with further investment.

On the industry side, there have been two notable reports, the first commissioned by SEAI and focused on engineering and specialist support requirements for ocean energy²⁸. The most recent work – undertaken by SLR Consulting for SEAI and Enterprise Ireland- was broader in scope and brought offshore wind into account as well as wave and tidal and will be the point of focus here²⁹.

The latest-‘SLR’-report makes the point about the connection between offshore wind and ocean energy succinctly:

‘Working in the same environment, the wave and tidal energy sector and the offshore wind sector face common challenges and, in some areas, have similar supply –chain needs. Experience gained and challenges overcome in the supply of either sector will be transferable between sectors and to other markets, and will help to realise the potential of Ireland’s domestic offshore renewable energy markets’ p7.

It should be noted that this is not a universal view. One Scottish expert who contributed to this study, for example, believes that the evidence to date in the UK does not support the contention that there is a major overlap between the ocean energy and the wind (onshore or offshore) supply chains.

The work undertaken by SLR divided the industrial end of the supply chain into a number of categories, as **Figure 2** illustrates.

Activity

Category

Strong and Immediate Capability in Ireland

- Project design
- R and D
- Environmental Impact Assessment
- Survey and support vessel operations
- Ancillary equipment
- Electrical controls
- Mooring systems
- Onshore convertors/substations
- Training in offshore technology

²⁷ Irish Ports Offshore Renewable Energy Services (IPORES) – A Review of Irish Ports Offshore Capability in Relation to Requirements for the Marine Renewable Energy Industry by IMDO- Marine Institute for SEAI, October 2012

²⁸ Review of Engineering & Specialist Support Requirements for the Ocean Energy Sector SEAI, prepared by RPS June 2009.

²⁹ A Study of the Supply Chain Requirements and Irish Company Capability in the Offshore Wind, Wave and Tidal Sector SEAI and Enterprise Ireland, prepared by SLR Consulting April 2012

ICT solutions

Limited Capability or Transferable Skills

Concrete foundations
Wind turbine and foundations installation
(service and support vessels)
Wind turbine towers (steel, concrete)
Wave energy hull and PTO systems
Installation project management

Figure 2

In addition, the areas of Wind Turbine Manufacture and Subsea Cables and Cable Installation were judged as ones in which there is *Very Limited Local Capability* and, moreover, were deemed to be critical supply chain bottlenecks. The consultant's recommendations include: prompting partnerships, seeking an offshore wind test-bed (as an incentive for turbine manufacturer(s) to locate here), urging companies to seek vendor qualifications (via e.g. UVDB accreditation), continuing support for research and development and encouraging the engagement of the ICT industry with the sector.

7. Strategic Questions Put to the Supply Chain

A wide variety of supply chain interests ranging from device manufacturers to utilities to consultants to State agencies and so on were interviewed for this paper. The structured dialogue with industry confirmed the validity of the three core questions that had been identified at the desk research phase. The interviews with industry and others focused on the issues they prompted:

First, *what is the level of awareness generally across the various interest groups in the supply chain about the opportunity presented by ocean energy and what is the practical impact of that awareness?* There was evidence of awareness among ports from previous work³⁰ but not among other groups.

Second, *what are the views of the supply chain about the role and performance of government and its agencies in developing the opportunity?*

Third, and perhaps most important of all, *what are the key events or developments that must take place to prompt industry to recognise and to act on (e.g. with new investment)*

³⁰ See footnote 26

ocean energy as a serious business opportunity? In other words, is there a consensual tipping point which would prompt a discrete and significant supply chain for ocean energy to emerge in the Republic of Ireland? Allied to this question, of course, is the actual capability of existing 'players' in the supply chain to grow and to develop as a significant infrastructure both to support the ocean energy industry here and to supply international developments.

8. Awareness of Opportunity and Scale of Current Business

The engagement with the supply chain identified a high degree of awareness across the board about the opportunity in offshore wind and an appreciation that this could in time lead on to business in wave and tidal energy developments. Indeed, the chain sees a clear relationship between its development on foot of offshore wind opportunities and its interest in, and capacity to deal with, the subsequent wave and tidal sector. As might be expected at this stage, the scale of current business at home or on export markets being undertaken in ocean energy is small.

8.1 Awareness of Opportunity

'Ocean energy is a bit like religion: everyone has their own version!'

'Great potential in ocean energy..... now must move on it.'

'...carefully following renewables and seeking opportunities'

'Lots to be done in the non-research world to get the sector going'

'Improving awarenessin wait-and-see mode....encounters less and less businesses that are unaware'

'Insofar as awareness in supply chain, it relates to offshore wind. Even then ...companies don't see the opportunity as relevant to them'

'See Ireland as stepping stone to work in UK off the back of the Irish experience'.

'Need mechanism to get money to device developers- that will get the supply chain underway'

'Danger of ocean energy going off the boil if no progress soon'

'...very awarebut sceptical of the potential'

'Big issue is: when is it happening, well aware of the opportunity'

'Well aware of energy potential of wave and tidal but plenty of other energy sources that are more economical'

'Don't see immediate opportunity in wave; long way to go in tidal....Are there enough TWhrs for tidal in RoI? Yes in NI.'

'Very much aware...'

'It's a long game'

8.2 Scale of Business

'We have vessels operating in UK but nothing operating out of Irish ports'

'Governances structure and historic approach of ports limits marketing e.g. agency driven port like Dublin'

'Ocean energy is 25% of turnover and growing....'

'No business. Need to be generating €200k p.a. to make ocean energy interesting '

'(Open Hydro) Business in NI, Canada, US, France'

'Providing courses to Renewables UK standard (principally for wind but spin on to wave and tidal), first outside of UK to attain required approvals. Investment for the future.....business volume is currently low but planning for the future'

'Did look at offshore wind but couldn't get long term contracts. Not bankable, therefore, in the context (e.g.) of new ship-construction finance'

'Export market should be made readily available and with operating support e.g. ROCs'

'89% of turnover outside of Ireland; all wave and tidal is export'

'Seeking work (wind) in west coast UK..... May open office in UK'

'Only opportunity at present is in consultancy which traditionally we don't do'

9. Views on Government and Agencies

The views on Government and its agencies are consistent. The MRIA is concerned at the failure so far of Government to co-ordinate and promote the Irish opportunity in a coherent fashion and this is reflected below in the views expressed by interviewees. However, the agencies, such as IDA, Enterprise Ireland and SEAI, are well regarded for their efforts in ocean energy even if deemed to be taking an overly cautious view of the sector. Ports and port related activities are frustrated by the perceived lack of progress on ocean energy.

'Sense that the opportunity is disappearing due to lack of Government cohesion, lack of activity'

'Ports generally interested in ocean energy, State development bodies don't understand ports but do understand industry'

'Appears that the Scottish and English equivalents of EI are finding it difficult to get local supply chain involved in offshore wind in part because the offshore wind has not yet full rolled out'

'Government not viewing and treating ports as a valuable resource. There is a need to invest in them. Look at Belfast'

'Treat oil, gas, wind etc as one industry and look for opportunities across the board'

'Need better co-ordination of the Irish pitch'

'More engagement with Enterprise Ireland and the Government's Marine Co-Ordination Group to get ownership (of ocean energy) more widespread'

'SEAI hugely supportive- has a lot of knowledge'

'Working with EI and IDA to source work in Eastern Europe'

'EI's soft supports are great...we don't really go to them for money.....EI slowly changing for the good in attitude to ocean energy'

'Wave is early technology stage and is 'very bespoke''

'Scotland better organized, Ireland lacks political coordination'

'Lack of cohesion among the agencies re ocean energy'

'Really helpful if clear messaging re ocean energy; suggest competition for funding for WECs and TECs- fairest and most transparent way forward. Do on basis of moving along Technology Readiness Levels (TRLs) from x to y'

'Agencies absolutely appalling- out to frustrate people who want to employ people and build businesses..... but OEDU is very positive'

'IDA and other agencies won't bring in business, have to do it ourselves'

'State agencies also in 'wait and see' mode- purport to support but support is not unequivocal and business people pick up on this'

'State messaging must be clear: Ireland is going for this'

'SEAI is very supportive, EI/IDA are helpful and forthcoming'

'Treat oil, gas, wind etc as one industry and look for opportunities across the board'

'Go for levy on oil and gas offshore to put into energy related R and D in the universities a la the Brazilian practice- 2 % of revenue to R and D'

'Doesn't help that Marine is all over the place and there is no specific policy for the Marine, it needs its own 'home''

10. 'Tipping Point' for the Supply Chain

Industry's view is that the tipping point for the supply chain would be the arrival of *real, tangible, achievable business* opportunities which rely on a clear policy framework from the Irish Government. One key to achieving the tipping point and moving beyond it is the Government's proposed export deal with the UK and the scope this would present to attract a wind energy related activities here. Momentum gained in this way should carry on naturally in time to wave and tidal.

'Engineering in Ireland reacts well to situations, opportunities but is not proactive'

'Must 'package' what we have to sell to reach a tipping point'

'This must be done from centre (Government) and be coherent'

'We need one big international player soon – e.g. wind- to generate credibility'

'Attraction by IDA of a wind project would open things up'

'The 'exports' deal being negotiated by Government would prompt big developments and open up real local opportunities for the supply chain'

'More interconnectors (key to future)'

'More contracts is the key to developing the supply chain; more certain stream of work'

'Opening up of export market for electricity would catalyse activity and generate supply chain development'

'Dipped toes in water' and expected wave and tidal both to be quasi commercial by now'

'It is hard for small companies to grow in marine renewables; much smaller industry than oil and gas and hard for small companies to grow in it.'

'Tipping point would be a big project e.g. a big offshore wind project'

'We need projects albeit initially at experimental level e.g. Westwave, MPT, Carnegie'

'A strategic view of the sub supply industry must be taken. Nonsense to suggest that e.g. Ireland does not have the skills to build wind towers etc.'

'Wave energy presents a far greater opportunity than wind to create jobs'

'Need a modern Linkages Programme for this industry'

'Key is pilot projects'

'Cables are real big issue, not enough manufacturing capability in the world'

'Scale and opportunity is the issue'

'Already enough happening in offshore wind in Europe to provide significant business (for NMCI)'

'We are in this industry for the long haul and have to take a very positive view.'

'Wave and tidal are 15 years away- need technology step change'

'Offshore wind is way to go, scale is tipping point for wave and tidal'

11. Perceived Capability Gaps

The supply chain had relatively little to say about capability gaps, either in their own or in other companies and sectors. A number of interesting points arose, however: companies are fairly realistic about where national strengths and weaknesses lie in

ocean energy supply chain terms; collaboration with Scotland (i.e. Scottish firms) is seen as desirable; and, generally, partnerships scored as a way of advancing once the ocean energy opportunity begins to manifest itself.

'We don't have heavy engineering capability in Ireland'

'Should be a supplier of niche products'

'By responding capably to initial local work gets over e.g. Siemens saying 'what is wrong with using my usual (German) supplier?''

'The wind industry has 'globalised' around a German/Danish supply chain so far'

'Our offer should be

- 1. Environmental Impact Statements where we are already strong*
- 2. IT- data collection and monitoring,*
- 3. O and M*
- 4. Project management*

But biggest need is an IDA project'

'Gaps: engineers with offshore experience; coastal engineering knowledge combined with structural engineering

Not enough specialist ships, skills anywhere to support even offshore wind'

'If activity takes place in Ireland, then the supply chain will develop. A lot of companies are setting up or undertaking trials in Orkney and 'Irish learning' needs to take place in Orkney'

'Technology Readiness Level is a clear way of distinguishing whether a particular Wave Energy Convertor or Tidal Energy Convertor is ready or not. Industry needs to have a clear assessment methodology based on TRL'

'Nothing needed. See the next 6-7 years focused on on-and-off shore wind and then tidal and then wave with perhaps 7 years 'life' in each of them.'

'Supply chain generally is ok re shipping and ports'

'Global procurement – blades from Ireland, magnets from China and Netherlands, boatbuilding in Netherlands'

'Supply chain, particularly at the heavier engineering end, is closed to local companies e.g. DONG will largely source from Denmark and Germany'

'Focus on niche products and services e.g. O and M'

'Always do partnerships... But...opportunities need to be thereslow roll out of the industry means many disappointments'

'Partnerships are critical'

'Partnerships take a long time'

'Partnerships are obvious way forward if had money at this stage in our company's development'

'Approached by Scottish Enterprise to locate in Scotland and participate in supply chain'

'Companies may need to be pre-qualified before formally joining marine renewables supply chain e.g. SEAI database'

'Look to Scotland for collaborative opportunities'

'Interested in Scotland's shortages which it would be to Ireland's advantage to seek to meet'

'Helping companies to enter the supply chain, starting with wind including offshore'

12. Conclusions and Recommendations

12.1 Conclusions

The Association drew the following *conclusions* from the review of past experiences, reports and the interviews undertaken for this study.

Opportunity

There is an enormous opportunity for the supply chain in meeting the requirements of marine renewables- offshore wind, wave and tidal energy- in domestic waters and particularly export markets

Awareness

There is some awareness in all sectors of the specific wave and tidal opportunity.

Government Support

Most importantly, there is a clear need for Government to set out a structure to enable the private sector supply chain to identify and meet the enormous opportunity in Ireland and, particularly, abroad. Much of this work may be in the policy field (e.g. providing fit-for-purpose Consenting legislation and addressing the current lack of a consenting process). Some of it will involve judicious financial investment by government. Some of it will involve a better resourced effort to promote the industry at home and abroad.

'Tipping Point'

The real tipping point is likely to arise when the Government's planned export arrangements with the UK prompt a major wind project with an offshore component to get underway which in turn should enable IDA to attract a turbine manufacturer which in turn.....Such a 'virtuous circle' of development, when coupled with finalisation and vigorous promotion of various policy and legislative initiatives now in the pipeline, would transform confidence, prompt a build-up in the sector from both FDI and

domestic sources and, ultimately, contribute to the skills and capacity necessary to gain significant market presence in world-wide wave and tidal developments.

Support for SEAI/ Enterprise Ireland 'SLR Report'

Finally, we endorse the recommendations – to address ‘gaps’ in the supply chain - set out in the SLR report promoted by SEAI and Enterprise Ireland– see 6.5 above.

12.2 Recommendations

This paper makes a number of recommendations which we believe the government should implement without delay. Taken together, these will create the confidence this industry requires to achieve its enormous potential to create jobs. The common issue at present is a lack of assurance that Government is fully engaged with and planning to lead the exploitation of the ocean and the general marine renewables energy opportunity. This may be misjudged to some extent – see 4.1 and 4.2 above – but there is undoubtedly a confidence issue to be dealt with if this sector is to achieve its enormous potential to create jobs.

Policy Framework

First, the MRIA urges the Government to seize the potentially transformational opportunity presented by ocean energy and drive through the required policy instruments and provide, where necessary, financial support: for research and development; revenue support through the REFIT mechanism for demonstration projects.

Without such a policy framework, ocean energy will not materialise in Ireland for a number of years and investment and development activity, and associated supply chain and jobs growth, will migrate to jurisdictions with extant and working leasing, consenting and revenue support schemes.

Key Actions

Specifically, to capitalise on Ireland’s natural advantages in ocean energy, and to maximise the ‘capture’ of the supply chain the Irish Government should accelerate the provision of a:

- Limited ocean energy *Renewable Energy Feed-In Tariff* (REFIT) to incentivise early investment
- Clear consenting process administered by a single body (An Bord Pleanála) offering developers – whether of demonstration arrays or, later, of export oriented ocean energy farms - a clear route to a fully consented site...with a proactive landlord in the form of the Department of Environment, Heritage and Local Government
- Capital grants regime which addresses the needs of device developers for substantial support at this critical emergent stage of ocean energy technology
- Clear route to grid access for demonstration arrays and, in time, ocean energy-based electricity exporters.

- A strong Ocean Renewable Energy Development Plan backed up by an implementation group with industry involvement

Support for Global Sourcing Initiative

We should learn from the lessons of history, in particular the experience gained in the development agencies twenty years ago with regard to building a supply chain for the electronics industry. One key initiative which worked well in building up domestic suppliers was the National Linkages Programme. This was housed at the time in IDA (in the functional area which later emerged as Enterprise Ireland) and was led by a leading industrial figure on a fixed term contract who was supported by a small team of highly rated executives seconded by other agencies. The team, essentially, raised awareness in domestic companies of opportunities to supply the multinational electronic companies of the day with an emphasis on informing them about the standards required to meet their needs. In addition, mentoring, training courses etc were laid on to raise standards in the potential supply companies. On the demand side, the multinationals were prompted to work with the local firms and to become stakeholders in the Programme.

A weakness, judged with the benefit of hindsight, was the failure to understand – the knowledge and precedents didn't really exist at the time – the vital importance of a strategic approach. Companies in a supply chain facing a new opportunity such as that presented by ocean energy, have two choices: they can benefit from local opportunities for a period but ultimately lose out as customers seek global solutions from their supply chain...or, they can plan from an early stage to scale up and internationalise their operations as a number of Irish companies, with origins in the old electronics days, have successfully done. A variation on the National Linkages theme arose with the appointment of a National Software Director in the 1990s who was responsible for fostering the indigenous software industry but this appointment placed relatively little emphasis on traditional sub- supply.

MRIA believes that a similar approach should be taken for marine renewables (i.e. including offshore wind). It should be updated to incorporate the lessons of Enterprise Ireland's *Global Sourcing* experience. The new programme should be:

- Headed by a senior and respected industrial figure on a fixed term contract (and with a financial package in line with industry norms)
- Located within Enterprise Ireland and with a small staff of top performers seconded for a fixed period from Enterprise Ireland and other bodies. In particular, SEAI should work closely with Enterprise Ireland on this programme.
- Mandated to galvanise local companies to rise to the marine renewables opportunity and to get real engagement from the major companies on the demand side: major device manufacturers, systems integrators, EPC houses etc

The Government should seek to have the programme co-funded³¹ by, for example, a levy or charge on the major developments which will be enabled by the forthcoming exports deal with the UK.). A precedent already exists – in the Department of Communications, Energy and Natural Resources - with the hydrocarbons industry where, under the Petroleum Exploration and Production Promotion and Support (PEPPS), at least two programmes are supported – Irish Shelf Petroleum Study Group (ISPSG) and the Expanded Offshore Support Programme (EOSG).

Overview

In sum, Government should seize the opportunity presented by ocean energy and drive through the required policy instruments, allocate the necessary public servants to work in the area and provide suitable financial support.

³¹ Given that the agencies continue to fund their own, seconded, staff, the total annual cost should amount to no more than about €300k pa

Appendix

The following companies and institutions were interviewed on behalf of MRIA for this report:

Arup

ESBI

Cathx Ocean

Techworks Marine

Siemens

Open Hydro

IMDO

Atlantic Ocean Energy Alliance

Marine Institute

Mainport Holdings

Bord Gais

CMRC

NMCI

Burke Shipping

Mainstream Renewable Power

Irish Dredging Company

Enterprise Ireland

Dun Laoghaire County Council

Ocean Energy

Lotus Automation